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ber 12 August 21, 1957

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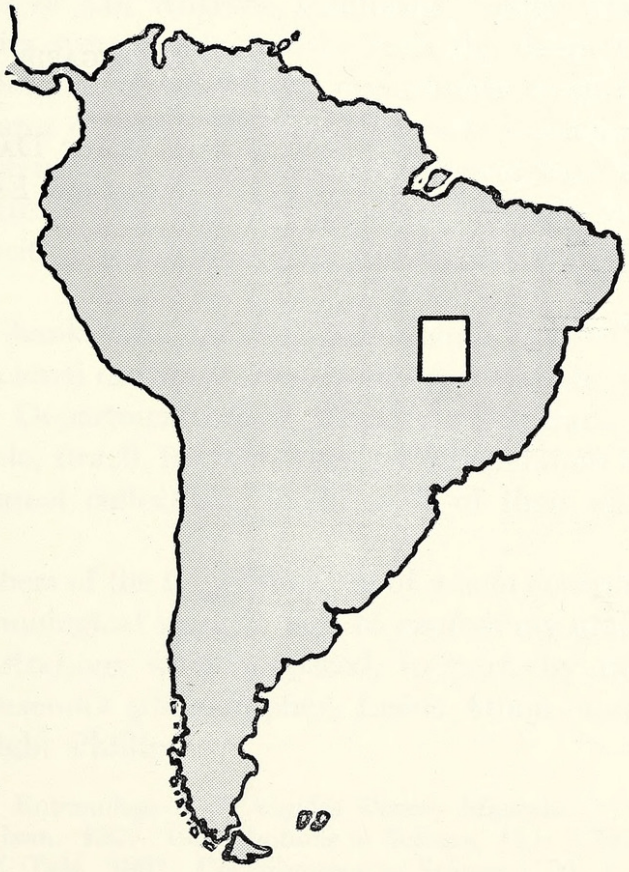
ENTOMOLOGY: General; Systematics of Notonectidae (Hemiptera)

By Fred S. Truxal



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CONTRIBUTIONS IN SCIENCE is a series of miscellaneous technical papers in the fields of Biology, Geology and Anthropology, published at irregular intervals by the Los Angeles County Museum. Issues are numbered separately and numbers run consecutively regardless of subject matter. Number 1 was issued January 23, 1957. The series is available to scientists and scientific institutions on an exchange basis. Copies may also be purchased at a nominal price.

THE MACHRIS BRAZILIAN EXPEDITION

ENTOMOLOGY: General;

Systematics of the Notonectidæ (Hemiptera)

By FRED S. TRUXAL[1]

INTRODUCTION

The Machris Brazilian Expedition of 1956 was sponsored for the Los Angeles County Museum by Mr. and Mrs. Maurice A. Machris and Mrs. Maybell Machris Low. Cooperating in the work of the Expedition, also, was the Museu Nacional do Brasil. A general account of the Expedition has been presented in this series by Jean Delacour[2], and the plant associations throughout the area traversed have been discussed by E. Yale Dawson[3]. These general features, therefore, will be given only brief attention in the present account, which is concerned with the entomological aspects of the Expedition.

The writer wishes to acknowledge herewith his indebtedness to those who have aided him in his work. First, to Mr. and Mrs. Maurice A. Machris of Los Angeles, California, under whose sponsorship these studies were conducted, he feels the deepest obligation and gratitude for the incentive and opportunity to investigate a much neglected area of Brazil. Without the enthusiasm and spirit of these two, the intent of the Expedition could never have been completely fulfilled. He is also indebted to Mrs. Maybell Machris Low for her generosity in contributing to the Expedition's general financial needs.

Special thanks are due Dr. José Candido M. Carvalho of the Museu Nacional do Brasil, Rio de Janeiro, and Dr. Paulo E. Vanzolini of the Departmento de Zoologia da Secretaria da Agricultura de São Paulo, Brazil, for their help and cooperation in making available the insect collections and records of their respective institutions.

To members of the Expedition, all of whom contributed materially to the entomological work, I wish to express my gratitude.

The illustrations were prepared, in part, by the Los Angeles County Museum's photographer, Lewis Athon, and the museum's artist, Dwight Phillip.

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[1] Curator of Entomology, Los Angeles County Museum.
[2] Delacour, Jean. 1957. Contributions in Science, (1): 1-12.
[3] Dawson, E. Yale. 1957. Contributions in Science, (2): 1-20.

Fig. 1. Map showing route of the Expedition in Brazil (dotted lines) and area studied (rectangle).

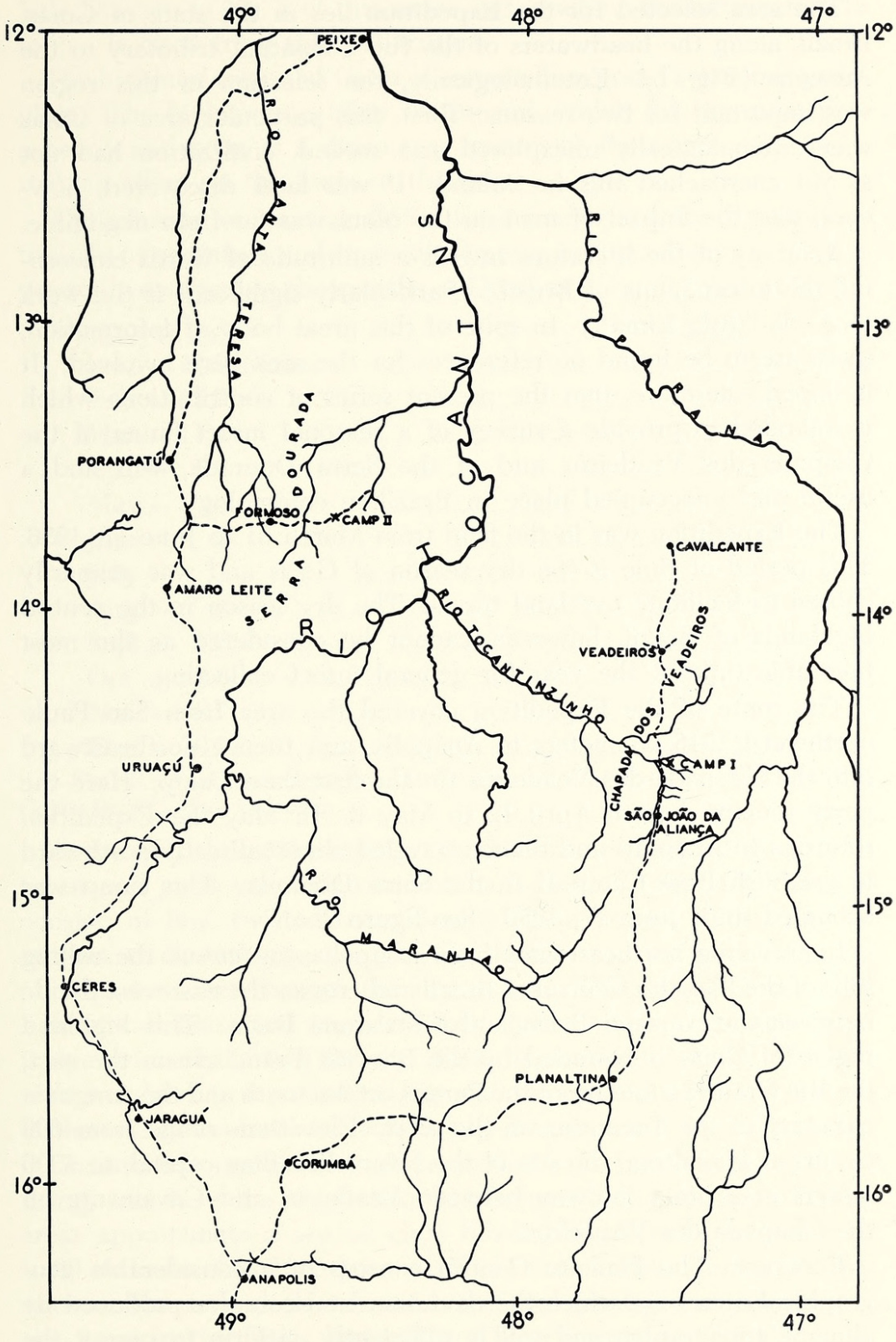


Fig. 2. Map showing detail of the area studied.

GENERAL ACCOUNT

The area selected for the Expedition lies in the state of Goiás, Brazil, along the headwaters of the Rio Tocantins, tributary to the Amazon (Fig. 1). Entomologically, the selection of this region was important for two reasons. First, this particular area of Goiás was entomologically unexplored and second, civilization had not as yet encroached this far inland. It was later discovered, however, that the impact of man on the biota was far from negligible.

A survey of the literature reveals a multitude of words concerning the insect fauna of Brazil. (Particularly significant is the work of A. da Costa Lima[4].) In spite of this great body of information, there are to be found no references for the area here involved. It is hoped, therefore, that the present series of contributions which is intended to provide a survey of a seasonal insect fauna of the Chapada dos Veadeiros and of the Serra Dourada, will find a useful and unoccupied place in Brazilian entomology.

The Expedition was in the field from March 31 to June 17, 1956. This period of time is the dry season of Goiás and was primarily chosen to facilitate overland travel. The dry season in the central highlands of Brazil, however, cannot be considered as the most favorable time of the year for general insect collecting.

The route of the Expedition covered the area from São Paulo northward 1046 kilometers to Anápolis, and thence northeastward into the Chapada dos Veadeiros for the first Base Camp. Here the party remained from April 12 to May 6. In May the Expedition returned to Anápolis and thence traveled almost directly northward to establish Base Camp II in the Serra Dourada. This camp was occupied until June 17, 1956. See figure 2.

In traveling northeastward from Anápolis one enters the rolling hills of the Planalto Centrál of Brazil and crosses the east-west divide between the Amazon Basin and the Paraná Basin. This highland region of Goiás is bounded by the Rio São Francisco on the east, the Rio Grande tributary of the Paraná on the south and the Araguaia tributary of the Tocantins on the west. Elevations range from 600 meters at Planaltina, the site of the future Brazilian capital, to 1300 meters at a point midway between Veadeiros and Cavalcante on the Chapada dos Veadeiros.

ECOLOGY. The Planalto Centrál consists of a considerable geographical area over which the environmental complex produced by climate, topography, and soil is sufficiently uniform to permit the development of characteristic types of ecologic associations. The

[4] Lima, A. da Costa. 1939-1953. Insetos do Brasil, 8 vols.

ecology of central Goiás has been very well described by Dr. E. Yale Dawson in No. 2 of this series and much of the information to follow is cited from this publication.

The highland region of Goiás is essentially a post-Cretaceous peneplain. The high permeability of the soil, which for the most part is sandy and poor, is a distinctive feature of the region and has a striking effect on the biota of the area.

The climate of central Goiás is characterized by fluctuations in daily temperature and in seasonal precipitation. Heavy rainfall is generally confined to the months of October through April (Fig. 3).

Goiás, GOIÁS	Formosa, GOIÁS
Jan. — 11.9 inches	12.0 inches
Feb. — 11.7	8.0
Mar. — 11.4	6.0
Apr. — 5.0	5.0
May — .4	.5
June — .5	.4
July — .1	.4
Aug. — .4	.5
Sept. — 1.8	2.0
Oct. — 4.8	5.0
Nov. — 8.7	8.0
Dec. — 10.2	12.0

Fig. 3. Average annual rainfall for two cities of the Planalto Centrál of Goiás, Brazil. After Delacour.

At present, almost the entire state of Goiás is occupied by a scrub forest and grass vegetation known as "*cerrado*" (Fig. 4). *Cerrado* consists of low, twisted trees, 3 to 8 m. in height, with irregular crowns, thick corky bark, and large leathery leaves which for the most part remain through the dry season. The ground cover consists of tall grass and scattered low shrubs. This vegetation type is due primarily to two factors. First, as previously stated, the *cerrado* is subject to a prolonged dry season, and secondly, the stature of the vegetation has been reduced by frequent and severe burning.

Occasionally one finds small areas that have been protected from firing, and here the vegetation has become tall and close. These areas approximate a second class forest characterized by trees 12 to 20 m. in height which become 30 per cent leafless during the dry season. The second class forest is the next most prominent vegetation type in the Goiás highlands. These forests are for the most part confined to the banks of streams and rivers.

A third vegetation type existing in the Planalto is the three-layered

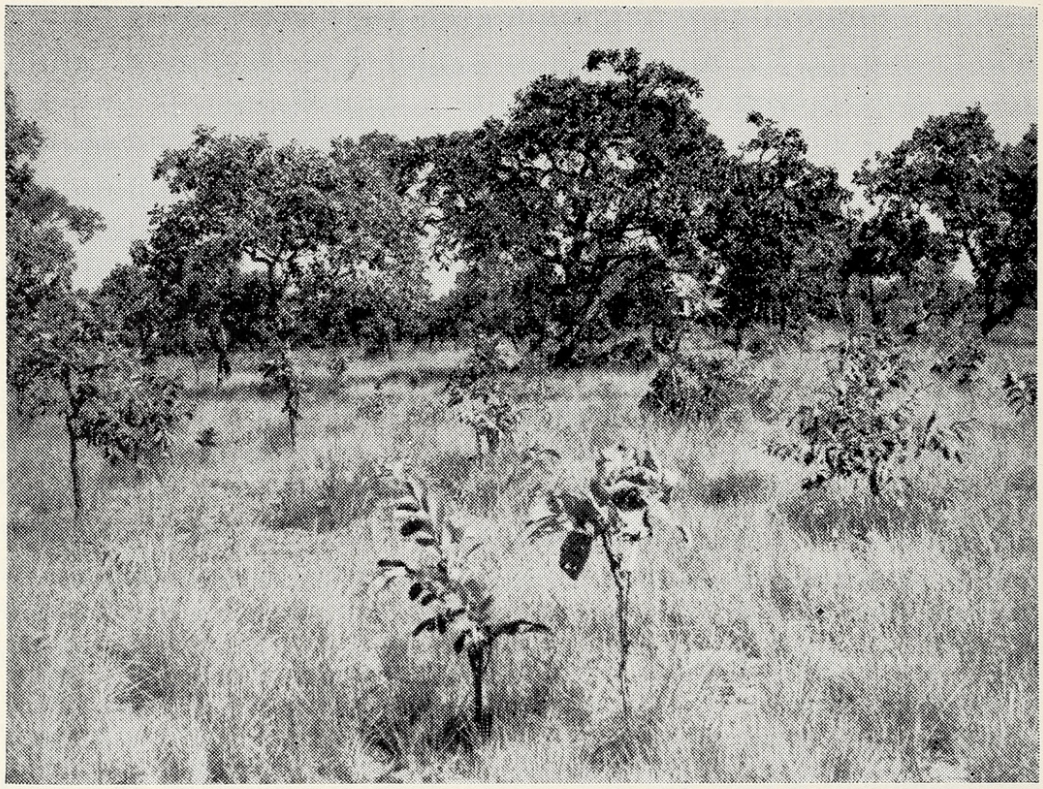


Fig. 4. *Cerrado* as seen in the vicinity of São João da Aliança, typical of the predominant vegetation of Goiás.

first class forest (Fig. 5). Here one finds a canopy of deciduous trees 20 to 30 m. in height, a second layer of more or less evergreen trees 5 to 15 m. in height and a forest floor layer of evergreen herbs and shrubs. The environmental conditions responsible for these fine forests are exceptionally favorable soil fertility, ample water and long freedom from fire. A considerable area of this vegetation type occurs in the Serra Dourada.

The well-developed *cerrado* and poor gallery forests, as well as the forest edges, supported a plentiful insect fauna. Very few insects were taken in the first or second class forests.

COLLECTING SITES. For the most part, entomological collections were made in the vicinities of the two base camps, both located on the headwaters of the Rio Tocantins.

The first base camp was established 20 kilometers north of São João da Aliança at approximately 1000 meters elevation. Vegetation consisted primarily of scrub forest and grassland dissected by numerous small streams whose margins supported forests of moderate height and density. Numerous termite mounds throughout the grasslands, however, indicated the former presence of a more dense woody vegetation (Fig. 6). Immediately east of camp was a shallow

Fig. 5. First class forest, illustrative of the luxuriant vegetation that exists in the Serra Dourada area of Goiás.

pond and marsh, as well as numerous small ox-bows left by the meandering stream known on the south bank as Jatobá and on the north bank as Pedras de Amolar. A characteristic of the Planalto in general is the occurrence of abundant shallow lakes, marshes and springs on the surface of the water-filled soil. This situation provides for a luxuriant aquatic insect fauna. Approximately 35 to 60 kilometers to the north of Base Camp I, in the vicinity of Veadeiros,

a markedly different insect fauna was encountered. This was to be expected as the flora likewise differed greatly, due in part to extensive sandstone outcrops in a broken terrain of rocky hills and buttes (Fig. 7). The comparatively sparse vegetation, containing many

Fig. 6. Numerous termite mounds on the Chapada dos Veadeiros indicate the former presence of a more dense woody vegetation.

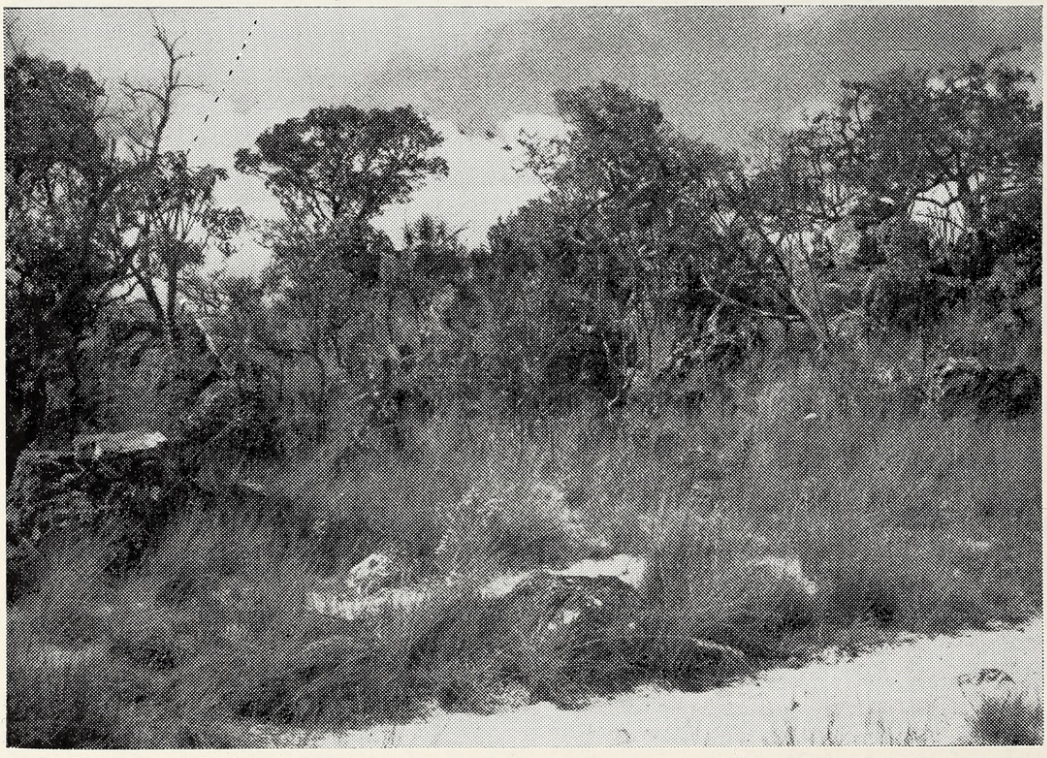


Fig. 7. A sandstone outcrop near Veadeiros supports a rich and varied insect fauna.

succulent terrestrial xerophytes, suggested, somewhat, a Sonoran desert aspect.

Temperatures ranged from a maximum of 84°F. to a minimum of 54°F. during the period of collecting at Base Camp I.

The second base camp was located in the southern Serra Dourada, 20 kilometers southeast of Formoso (Amaro Leite County) at an elevation of 800-1000 meters. The vegetation about camp consisted chiefly of well-developed *cerrado* on the hill slopes and crests with extensive second and first class forests along the streams and lowlands. Small streams and rivulets dissect this low mountainous region and in turn flow into the larger tributaries of the Rio Tocantins (Fig. 8).

During the first week in June, collections were made along the trailway between Amaro Leite and Peixe. Here, *cerrado* dominated the vegetation, with poor gallery forests following the stream beds.

Temperatures ranged from a maximum of 94°F. to a minimum of 46°F. during the period of collecting at Base Camp II.

Fig. 8. A small stream near Formoso, typical of the numerous small rivulets and streams that dissect the low mountainous region of the Serra Dourada.

RESULTS. With the exception of Protura, Zoraptera, Anoplura and Strepsiptera, all insect orders are represented in the approximately 10,000 specimens taken on the Machris Brazilian Expedition. The work of identifying this material is now being accomplished with the help of a number of specialists in North and South America. As work progresses, the results will be published in subsequent issues of this serial. The following is the first of these systematic accounts.

SYSTEMATICS

NOTONECTIDAE (HEMIPTERA)

FAMILY CHARACTERISTICS. The family Notonectidæ is composed of aquatic forms differing from all other such insects, except Pleidæ and Helotrephidæ, in the habit of swimming on their backs. They are deep-bodied, flat ventrally, and convex dorsally. The abdomen possesses a prominent longitudinal mid-ventral keel, having hairs at least along its lateral margins. These, together with the hairs along the sides of the venter, cover the two longitudinal troughs to form air chambers.

GEOGRAPHICAL DISTRIBUTION. The family Notonectidæ embraces eight genera with representatives in both the Old and New World. Two genera, *Notonecta* and *Enithares,* are found in both the Eastern and the Western Hemisphere; *Neonychia* and *Paranisops* are confined to the Eastern Hemisphere. *Nychia* belongs to the Eastern Hemisphere and has its counterpart *Martarega* in the Western Hemisphere; likewise, *Anisops* is found throughout the Eastern Hemisphere and is replaced by the widely distributed *Buenoa* in the Western Hemisphere.

Of the four genera representing the Western Hemisphere, all are to be found in Brazil and three, namely *Notonecta, Martarega,* and *Buenoa,* were taken by the Machris Brazilian Expedition. Fourteen species are represented. An annotated list of these, including descriptions of three new species, follows. All records are new for Goiás, Brazil.

KEY TO THE GENERA OF NOTONECTIDÆ[5]

A. Hemelytral commissure without definite hair-lined pit at anterior end.....(Subfamily Notonectinæ)

B. Intermediate femur with anteapical pointed protuberance and antennæ 4-segmented.....(Tribe Notonectini)

[5]Truxal, F. S. 1953. University of Kansas Science Bulletin, vol. 35, p. 1366. Modified from Hungerford.

C. Anterolateral margins of prothorax not foveate *Notonecta*
CC. Anterolateral margins of prothorax foveate.....*Enithares*
BB. Intermediate femur without anteapical pointed protuberance and antennæ 3- or 4-segmented.....(Tribe Nychini)
C. Sides of prothorax not foveate, the lateral ledge straight. Infracoxal plates bare but margined with hair. Intermediate tarsus with two well-defined segments and a very small basal one in both sexes.....*Neonychia*
CC. Sides of prothorax foveate, the lateral ledge curving downward to embrace the fovea. Infracoxal plates covered with hair. Intermediate tarsus with one well-defined segment, except in males of *Nychia*.
D. Antennæ 3-segmented.....*Nychia*
DD. Antennæ 4-segmented.....*Martarega*
AA. Hemelytral commissure with definite hair-lined pit at anterior end.....(Subfamily Anisopinæ)
B. Ventral abdominal keel not extending onto last abdominal segment. Male genital capsule cleft behind. Males without stridular protuberance on front tibia. Females with short gonapophyses.....*Paranisops*
BB. Ventral abdominal keel extending onto last abdominal segment. Male genital capsule closed behind. Males with stridular protuberance on front tibia. Females with long subspatulate gonapophyses.
C. Male with anterior tarsus 2-segmented.....*Buenoa*
CC. Male with anterior tarsus 1-segmented.....*Anisops*

Genus **NOTONECTA** Linnaeus

Notonecta Linnæus, 1758, Syst. Nat., 10th Ed., p. 439.

Several species of this cosmopolitan genus inhabit Brazil, but only one is represented in the present Goiás collections.

Notonecta disturbata Hungerford

Notonecta disturbata Hungerford, 1926, Psyche, vol. XXXIII, p. 13.

Goiás: Anápolis, April 8, 1956 (Truxal); 48 km. south of Peixe, June 1, 1956 (Truxal).

Genus **MARTAREGA** White

Martarega White, 1879, Trans. Ent. Soc. London, p. 271.

This is primarily a neotropical genus. Eight of the eleven described species have been recorded from Brazil. Two species are represented in the collections of the Machris Brazilian Expedition.

Martarega membranacea White

Martarega membranacea White, 1879, Trans. Ent. Soc. London, p. 272.

Goiás: 48 km. south of Peixe, June 1, 1956 (Truxal).

Martarega uruguayensis (Berg)

Signoretiella uruguayensis Berg, 1883, An. Soc. Cient. Argentina, vol XVI, p. 122.

Martarega uruguayensis, Jaczewski, 1928, Ann. Musei Zool. Polonici, vol. VII, p. 131.

Heretofore the macropterous form of this species was unknown. Among the numerous specimens of *M. uruguayensis* taken from central Goiás, a single male macropterous form was found. As in other species, it differs markedly from the brachypterous form. The hemelytron of the macropterous specimen is distinctly divided into corium, clavus, and membrane. The color of the hemelytron is black, whereas that of the brachypterous form is testaceous. The pronotum and scutellum are more feebly developed in brachypterous forms, the pronotum being less widened posteriorly and shorter, the scutellum smaller.

Minas Gerais: Uberlândia, April 5, 1956 (Truxal). *Goiás:* 20 km. north of São João da Aliança, April 23, 1956 (Truxal); 24 km. east of Formoso, May 18-22, 1956, and June 13, 1956 (Truxal); 124 km. south of Peixe, June 2, 1956 (Truxal).

Genus **BUENOA** Kirkaldy

Buenoa Kirkaldy, 1904, Wiener Ent. Zeit., vol. XXIII, p. 120.

This genus is widespread in the New World. Fourteen of the forty species heretofore described have been recorded from Brazil. In the collections of the Machris Brazilian Expedition, a total of eleven species are here recorded. These include one species not previously reported from Brazil and three species heretofore undescribed.

Buenoa pallens (Champion)

Anisops pallens Champion, 1901, Biol. Cent. Amer., Heteroptera, vol. II, p. 374.

Buenoa pallens, Kirkaldy, 1904, Wiener Ent. Zeit., vol. XXIII, p. 121.

Goiás: 34 km. south of Amaro Leite, May 30, 1956 (Truxal).

Buenoa paranensis Jaczewski

Buenoa paranensis Jaczewski, 1928, Ann. Musei Zool. Polonici, vol. VII, p. 126.

This species, previously recorded only from the state of Paraná, was quite common in the central Goiás collections.

Goiás: 20 km. north of São João da Aliança, April 23, 1956 (Truxal); 24 km. east of Formoso, May 29, 1956 (Truxal); 34 km. south of Amaro Leite, May 30, 1956 (Truxal); 48 km. south of Peixe, June 1, 1956 (Truxal); 124 km. south of Peixe, June 2, 1956 (Truxal).

Buenoa triangularis n. sp.

(Pl. I, fig. 2)

Size: Male, length 6.30–6.75 mm., greatest body width 1.33–1.95 mm.; female, length 6.66–6.96 mm., greatest body width 1.96–2.00 mm.

Color: General facies testaceous to nigro-violaceous. Head, pronotum, thoracic venter testaceous to brown. Scutellum nigro-violaceous with apex testaceous; methoracic dorsum black. Abdomen black, except ventral keel and portions of connexivum testaceous. Some specimens entirely yellowish white to pale testaceous, except most of abdomen black. This species variable in color.

Male Structural Characteristics: As viewed from above, outline of head laterally rounded, anteriorly truncate with vertex indented at its lateral margins; greatest width of head approximately six times the anterior width of vertex and less than humeral width of pronotum; synthlipsis one third the anterior width of vertex; along median longitudinal axis, head approximately half the length of pronotum; notocephalon sulcate dorsally; tylus slightly inflated; labrum with basal width distinctly less than twice its median length and apex bluntly rounded; rostral prong (Pl. I, fig. 2b) longer than third rostral segment, with base originating laterally near proximal end of third rostral segment, and with apex sharply rounded. Pronotum with its median length less than half its humeral width; disk only faintly impressed, not carinate; lateral margins divergent; posterior margin convex, medianly concave. Scutellum large, with median length greater than that of pronotum. Fore femur (Pl. I, fig. 2a) neither wide not thickened at apex; triangular stridulatory area consisting of five to seven sclerotized ridges. Fore tibia with stridulatory comb (Pl. I, fig. 2c) consisting of eighteen to twenty-two teeth; all teeth approximately same size and thickness. Chætotaxy of male front leg as shown on Plate I. Male genital claspers normal. Spine from caudo-sinistral margin of seventh abdominal tergite tapering gradually from base to strongly acuminate apex.

Female Structural Characteristics: As viewed from above, outline of head laterally rounded, anteriorly truncate with vertex indented

at its lateral margins; greatest width of head approximately six times the anterior width of vertex and less than humeral width of pronotum; synthlipsis wide, approximately half the anterior width of vertex; along median longitudinal axis, head approximately half the length of pronotum; notocephalon sulcate dorsally; tylus slightly inflated. Pronotum with its median length less than half its humeral width; disk only faintly impressed, not carinate; lateral margins divergent; posterior margin convex, medianly concave. Scutellum large, with its median length distinctly greater than that of pronotum. Female ovipositor of normal shape with teeth arranged in two longitudinal rows, one short row of approximately twelve large teeth and one long outer row of small teeth; approximately eight small, lateral, toothlike setæ near apex.

Comparative Notes: Superficially this species resembles *B. pallens* (Champion). Examination of the male, however, shows distinct differences as follows: lateral margins of the frons parallel rather than convergent toward the tylus, eyes distinctly longer, only five to seven sclerotized ridges in the femoral stridulatory area, and only eighteen to twenty-two teeth in the tibial comb.

Location of Types: Holotype male and allotype female, Veadeiros, Goiás, Brazil, April 30, 1956, F. S. Truxal, in the Museu Nacional do Brasil, Rio de Janeiro, Brazil. Paratypes as follows: In the Los Angeles County Museum, four males, ten females, Veadeiros, Goiás, Brazil, April 22 and 30, 1956, Truxal; in the Francis Huntington Snow Entomological Collections, University of Kansas, Lawrence, Kansas, one male, one female, same locality, April 22, 1956, Truxal.

Data on Distribution: Recorded from Brazil and known only from type series.

Buenoa platycnemis (Fieber)

Anisops platycnemis Fieber, 1851, Abhandl. Köngl. Böhmischen Gesells. Wiss., vol. VII, ser. 5, p. 485.

Buenoa platycnemis, Kirkaldy, 1904, Wiener Ent. Zeit., vol. XXIII, p. 134.

One finds in the literature and collections, many species masquerading under the name *Buenoa platycnemis.* This species is, for the most part, neotropical.

Goiás: 24 km. east of Formoso, May 18-29, and June 9-18, 1956 (Truxal); 48 km. south of Peixe, June 1-2, 1956 (Truxal).

Buenoa mutabilis Truxal

Buenoa mutabilis Truxal, 1953, Univ. Kansas Sci. Bull., vol. XXV, Pt. II, p. 1432.

The specimens recorded below are the first to be reported from Brazil. Heretofore, this species was known only from Haiti, Venezuela, British Guiana, Peru and Paraguay.

Minas Gerais: Uberlândia, April 5, 1956 (Truxal). *Goiás:* 20 km. north of São João da Aliança, April 23, 1956 (Truxal).

Buenoa amnigenus (White)

Anisops amnigenus White, 1879, Trans. Ent. Soc. London, p. 271.

Buenoa amnigenus, Kirkaldy, 1904, Wiener Ent. Zeit., vol. XXIII, p. 120.

This species is widespread in Brazil. Among the numerous specimens taken from Goiás, one finds considerable variation in the development of flight wings with consequent changes in the thorax and hemelytra.

Goiás: 24 km. east of Formoso, May 22-26, 1956 (Truxal); 124 km. south of Peixe, June 2, 1956 (Truxal).

Buenoa incompta Truxal

Buenoa incompta Truxal, 1953, Univ. Kansas Sci. Bull., vol. XXV, Pt. II, p. 1466.

Goiás: 20 km. north of São João da Aliança, April 23, 1956 (Truxal).

Buenoa salutis Kirkaldy

Buenoa salutis Kirkaldy, 1904, Wiener Ent. Zeit., vol. XXIII, p. 124.

This species is widespread throughout the north and central regions of South America. Macropterous forms are seldom found and only seven are recorded from the present Goiás collections. These specimens differ from the common brachypterous forms in having the head distinctly narrower than the humeral width of the pronotum; pronotum with the lateral margins more divergent; scutellum larger; hemelytra with claval sutures present and large membranes; flight wings fully developed.

Goiás: 48 km. south of Peixe, June 1, 1956 (Truxal); 124 km. south of Peixe, June 2, 1956 (Truxal).

Buenoa unguis Truxal

Buenoa unguis Truxal, 1953, Univ. Kansas Sci. Bull., vol. XXV, Pt. II, p. 1476.

This species is particularly widespread in northeastern Brazil.

Goiás: 48 km. south of Peixe, June 1, 1956 (Truxal); 124 km. south of Peixe, June 2, 1956 (Truxal).

Buenoa machrisi n. sp.

(Pl. I, fig. 1)

Size: Male, length 8.80–8.95 mm., greatest body width 2.45–2.60 mm.; female, length 8.30–8.90 mm., greatest body width 2.50–2.65 mm.

Color: General facies yellowish white to black. Head, pronotum, thoracic venter, and limbs yellowish white to pale testaceous; scutellum pale testaceous to black; metathoracic dorsum light brown to black. Abdomen black, except ventral keel and portions of the connexivum and dorsum pale testaceous. Hemelytra black with basal half of corium and most of membrane yellowish white. Some specimens entirely yellowish white to pale testaceous, except most of abdomen black. This species variable in color.

Male Structural Characteristics: As viewed from above, outline of head laterally rounded, anteriorly truncate with vertex indented at its lateral margins; greatest width of head six and one half times the anterior width of vertex and less than humeral width of pronotum; synthlipsis wide, approximately half the anterior width of vertex; along median longitudinal axis, head approximately half the length of pronotum; notocephalon wide, sulcate dorsally; tylus distinctly inflated; labrum with basal width not quite twice its median length and apex bluntly rounded; rostral prong (Pl. I, fig. 1b) short, shorter than third rostral segment, with base originating laterally near proximal end of third rostral segment, and with apex bluntly rounded. Pronotum with its median length less than half its humeral width; disk unimpressed, not carinate; lateral margins divergent; posterior margin convex, medianly concave. Scutellum large, with median length distinctly greater than that of pronotum. Fore femur (Pl. I, fig. 1a) neither wide nor greatly thickened at apex; lacking stridulatory area. Fore tibia slightly emarginate near distal end and with stridulatory comb (Pl. I, fig. 1c) consisting of fourteen to sixteen thick teeth; apical teeth wider and thicker than basal; a swollen area on inner surface of tibia at apex, densely covered with fine setæ. Tarsal claws of fore leg slightly dissimilar. Metatrochanter with oval stridulatory area on inner surface (Pl. I, fig. 1d) consisting of approximately seventeen sclerotized ridges. Chætotaxy of male front leg as shown on Plate I. Male genital claspers normal. Spine from caudo-sinistral margin of seventh abdominal tergite with apical half very narrow and apex strongly acuminate.

Female Structural Characteristics: As viewed from above, outline of head laterally rounded, anteriorly truncate with vertex indented at its lateral margins; greatest width of head six times the anterior width

of vertex and distinctly less than humeral width of pronotum; synthlipsis wide, approximately half the anterior width of vertex; along median longitudinal axis, head approximately half the length of pronotum; notocephalon wide, sulcate dorsally; tylus distinctly inflated. Pronotum with its median length approximately two fifths its humeral width; disk unimpressed, not carinate; lateral margins divergent; posterior margin convex, medianly concave. Scutellum large, with median length distinctly greater than that of pronotum. Metatrochanter with oval stridulatory area on inner surface. Female ovipositor of normal shape with teeth arranged in two longitudinal rows, one short row of approximately ten large teeth and one long outer row of small teeth; approximately eight small, lateral, toothlike setae near apex.

Variation Within Species: Occasionally specimens are found with flight wings not fully developed. These specimens are pale in color with pronotum narrower and lateral margins less divergent, scutellum smaller, and hemelytral membranes smaller than the form with fully developed flight wings. Claval sutures are absent in the hemelytra of brachypterous specimens.

Comparative Notes: Superficially this species resembles *B. distincta* Truxal. Examination of the male, however, shows distinct differences as follows: fore tibia emarginate at the distal end, and the spine from the caudo-sinistral margin of the seventh abdominal tergite not sword-shaped. The male genital capsules differ greatly.

Location of Types: Holotype male and allotype female, Veadeiros, Goiás, Brazil, May 1, 1956, F. S. Truxal, in the Museu Nacional do Brasil, Rio de Janeiro, Brazil. Paratypes as follows: In the Los Angeles County Museum, twenty males, twenty-three females, Veadeiros, Goiás, Brazil, May 1, 1956, Truxal; in the Francis Huntington Snow Entomological Collections, University of Kansas, Lawrence, Kansas, three males, one female, same locality, April 22, 1956, Truxal.

Data on Distribution: Recorded from Brazil and known only from type series.

The specific name honors Mr. Maurice A. Machris, co-sponsor of the 1956 Expedition to Goiás, Brazil.

Buenoa tibialis n. sp.
(Pl. I, fig. 3)

Size: Male, length 5.00–5.45 mm., greatest body width 1.66–1.75 mm.; female 4.90–5.65 mm., greatest body width 1.70–1.85 mm.

Color: General facies sordid white to nigro-violaceous. Head, anterior portion of pronotum, thoracic venter, and limbs sordid white to testaceous. Posterior portion of pronotum and meta-

thoracic dorsum black; scutellum black with apex testaceous. Abdomen black, except portions of connexivum and terminal segments testaceous. H e m e l y t r a hyalin with posterior third and anterolateral areas nigro-violaceous. Some specimens entirely sordid white, except most of abdomen and posterior third of hemelytra black. This species variable in color.

Male Structural Characteristics: As viewed from above, outline of head laterally rounded, anteriorly truncate with vertex slightly indented; greatest width of head seven and one half to eight times the anterior width of vertex and less than humeral width of pronotum; synthlipsis narrow, less than half the anterior width of vertex; along median longitudinal axis, head slightly more than half the length of pronotum; notocephalon narrow, sulcate dorsally; tylus slightly inflated; labrum with basal width approximately twice its median length and apex bluntly rounded; rostral prong (Pl. I, fig. 3b) short, shorter than third rostral segment, with base originating laterally near proximal end of third rostral segment, and with apex bluntly rounded. Pronotum with its median length less than half its humeral width; disk only faintly impressed, not carinate; lateral margins divergent; posterior margin convex, medianly concave. Scutellum large, with median length distinctly greater than that of pronotum. Fore femur (Pl. I, fig. 3a) neither wide nor greatly thickened at apex; lacking stridulatory area. Fore tibia with stridulatory comb (Pl. I, fig. 3c) consisting of twenty-one to twenty-five teeth; apical teeth wider and thicker than basal. Tarsal claws of fore leg slightly dissimilar. Tibia of intermediate leg dilated medianly on outer margin. Metatrochanter with sclerotized ridges of stridulatory area indistinct. Hind femur with longitudinal row of short, stout setae on ventral surface. Chaetotaxy of male front leg as shown on Plate I. Male genital claspers normal. Spine from caudo-sinistral margin of seventh abdominal tergite with apical half very narrow and apex strongly acuminate.

Female Structural Characteristics: As viewed from above, outline of head laterally rounded, anteriorly truncate with vertex slightly indented; greatest width of head six to six and one half times the anterior width of vertex and less than humeral width of pronotum; synthlipsis narrow, approximately half the anterior width of vertex; along median longitudinal axis, head slightly more than half the length of pronotum; notocephalon narrow, sulcate dorsally; tylus slightly inflated. Pronotum with its median length approximately one third its humeral width; disk only faintly impressed, not carinate; lateral margins divergent; posterior margin convex, medianly con-

cave. Scutellum large, with median length distinctly greater than that of pronotum. Tibia of intermediate leg slightly dilated medianly on outer margin. Metatrochanter with stridulatory area indistinct. Female ovipositor of normal shape with teeth arranged in two longitudinal rows, one short row of approximately twelve large teeth and one long outer row of small teeth; approximately fourteen small, lateral, toothlike setae near apex.

Variation Within Species: Occasionally specimens are found with flight wings not fully developed. These specimens are pale in color with pronotum distinctly narrower than that of the form with fully developed flight wings. Claval sutures and membranes are more feebly developed in the hemelytra of brachypterous specimens.

Comparative Notes: Superficially this species somewhat resembles *B. arida* Truxal. Examination of the male, however, shows distinct differences as follows: head distinctly wider in relation to the pronotum, notocephalon much narrower, and fore femur less robust and without stridulatory area.

Location of Types: Holotype male and allotype female, 24 km. east of Formoso, Goiás, Brazil, May 25, 1956, F. S. Truxal, in the Museu Nacional do Brasil, Rio de Janeiro, Brazil. Paratypes as follows: In the Los Angeles County Museum, thirty-four males, twenty-three females, 24 km. east of Formoso, Goiás, Brazil, May 23 and 25, 1956, Truxal, and two males, six females, same locality, June 9 and 18, 1956, Truxal; in the Francis Huntington Snow Entomological Collections, University of Kansas, Lawrence, Kansas, two males, two females, same locality, May 25, 1956, F. S. Truxal.

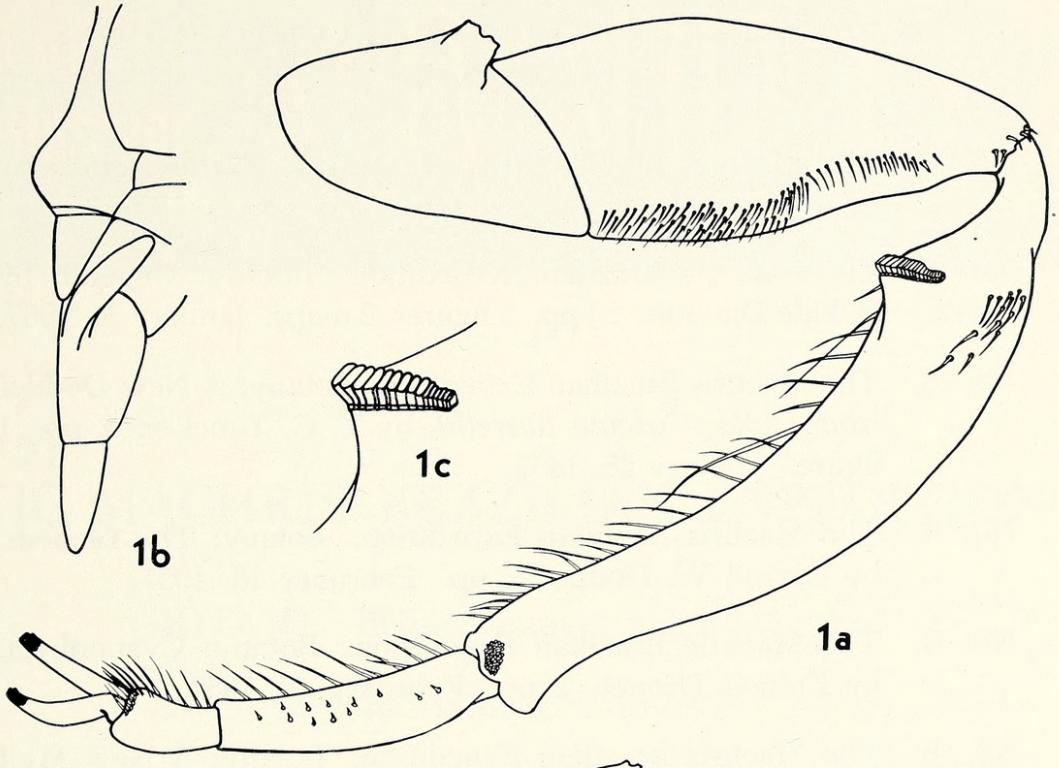
Data on Distribution: Recorded from Brazil and known only from type series.

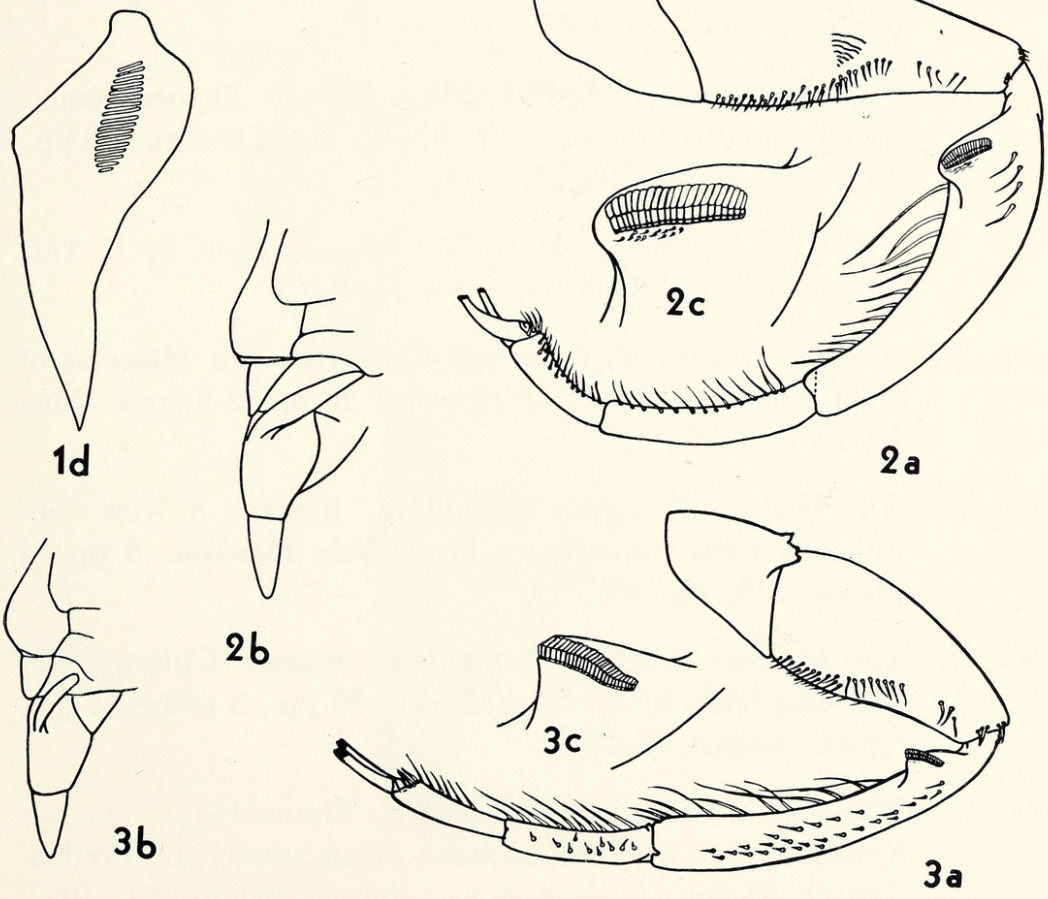
PLATE I

Fig. 1. *Buenoa machrisi* n. sp.
1a. Inner surface view of male left fore leg.
1b. Left lateral view of male rostrum and tylus.
1c. Enlarged view of left tibial stridulatory comb.
1d. Inner surface view of metatrochanter.

Fig. 2. *Buenoa triangularis* n. sp.
2a. Inner surface view of male left fore leg.
2b. Left lateral view of male rostrum and tylus.
2c. Enlarged view of left tibial stridulatory comb.

Fig. 3. *Buenoa tibialis* n. sp.
3a. Inner surface view of male left fore leg.
3b. Left lateral view of male rostrum and tylus.
3c. Enlarged view of left tibial stridulatory comb.


1b
1c
1a


1d
2c
2a
2b
3b
3c
3a